

Work Order ID 138673

Monday, November 09, 2015 8:21:01 AM

138673

Page 1

Item ID: D350-748-143TRN

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: SS Crosstube Turning Detail

Start Date: 11/9/2015 Start Qty: 1.00 ***1***

Cust Item ID:

Required Date: 11/9/2015 Req'd Qty: 1.00 ***1***

Customer:

Reference:

Approvals: Process Plan: MCS Date: **NOV 09 2015** Tooling: _____ Date: _____

Run Start ***NR1***

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

Draw Nbr	Revision Nbr	
D350-748-143	A	OK 15/11/9

100

0.00

100

MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.02

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs on both ends as per Folio _____

2-Turn first side as per Folio _____

3- File transition lines smooth.

FOLIO REV: AA

DWG REV: AA

1 6

mark
15/11/11

110

QC1- Inspection performed by CMM

0.00

110

QC

Memo

0.00

Quality Control

1 6

mark
15/11/12

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____		DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐		AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐					
Date :		Step #:		QTY Effective :			MRB (QSI042) Approval Completed By Lead hand / Supervisor Approval Verification QC / QA Coordinator Approval		
Description Work Order Deviation				Disposition					

Root Cause				FAULT CATEGORY							
Environment	☐	No Re-verification	☐	Pressure/Forced	☐	Temperature/Cure	☐	Power Loss/Surge	☐	Positioned Wrong	☐
Design	☐	Operator	☐	Bending	☐	Set-up	☐	Folio/Program	☐	Outside Dimensions	☐
Doc/Data	☐	Offset/Setup	☐	Centre Not Concentric	☐	BOM/Route	☐	Grain	☐	Over/Under tolerance	☐
Equip/Tooling	☐	Supplier	☐	Cracks	☐	Broken/Damage/Defect	☐	Weld	☐	Part Incorrect	☐
Handling/Pre	☐	Training	☐	Crimp/Kink/Ripple/Wave	☐	Inspection Incomplete/Unqualified	☐	Wrong Stock Pulled	☐	Part Lost/Missing	☐
Material	☐	Use for Testing	☐	Cuffs	☐	Contamination	☐	Out of Sequence	☐	Part Moved	☐
Internal Transport	☐	Poor Information	☐	Crushing	☐	Countersink	☐	Off-set	☐	Drawing	☐
Tribal Knowledge	☐	Rushing	☐	Heat Treat	☐	Cut Too Short	☐	Mislabeled	☐	Finish	☐
LOA	☐	Product Improvement	☐	Wave/Twist in Tube	☐	Instructions Incomplete/Unclear	☐	Fit/Function	☐	Misread	☐
Substation	☐	Process Improvement	☐	Marks/Chatter	☐	Drill Holes	☐	Misaligned/off center	☐	Turning Sequence	☐
Past Expiry Date	☐	Manufacturing Process	☐	OTHER :							
Misidentified	☐	Past Due	☐								

Work Order ID 138673

Monday, November 09, 2015 8:21:01 AM

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Page 2

Item ID: D350-748-143TRN

Accept

N900040100Setup Start ***NS1***

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Item Name: SS Crosstube Turning Detail

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Cust Item ID:

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1

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start ***NR1***

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
120	MORI SEIKI CNC LATHE LARGE	0.00							
120									
Mori Seiki	Memo	0.04							
Mori Seiki CNC Lathe Large	1-Turn second side as per Folio _____ 2- File transition lines smooth. 3-Scribe Part & Batch as per Dwg D350-748-143 FOLIO REV: <u>11</u> DWG REV: <u>12</u>								mmml 15/11/12
130	QC1- Inspection performed by CMM	0.00							
130									
QC	Memo	0.00							
Quality Control									mmml 15/11/13
140	QC8- Inspect parts - second check	0.00							
140									
QC	Memo	0.00							
Quality Control									DAS 47 9-89 15-11-17

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐			
Date : _____	Step #: _____	QTY Effective : _____		MRB (QSI042) Approval	
Description Work Order Deviation		Disposition		Completed By	
				Lead hand / Supervisor Approval Verification	
				QC / QA Coordinator Approval	
Root Cause Environment ☐ Design ☐ Doc/Data ☐ Equip/Tooling ☐ Handling/Pre ☐ Material ☐ Internal Transport ☐ Tribal Knowledge ☐ LOA ☐ Substation ☐ Past Expiry Date ☐ Misidentified ☐ No Re-verification ☐ Operator ☐ Offset/Setup ☐ Supplier ☐ Training ☐ Use for Testing ☐ Poor Information ☐ Rushing ☐ Product Improvement ☐ Process Improvement ☐ Manufacturing Process ☐ Past Due ☐		FAULT CATEGORY Pressure/Forced ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Wave/Twist in Tube ☐ Marks/Chatter ☐ Temperature/Cure ☐ Set-up ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Inspection Incomplete/Unqualified ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Instructions Incomplete/Unclear ☐ Drill Holes ☐ Power Loss/Surge ☐ Folio/Program ☐ Grain ☐ Weld ☐ Wrong Stock Pulled ☐ Out of Sequence ☐ Off-set ☐ Misabeled ☐ Fit/Function ☐ Misaligned/off center ☐ Positioned Wrong ☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Drawing ☐ Finish ☐ Misread ☐ Turning Sequence ☐			
OTHER : _____					

Work Order ID 138673***138673***

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Monday, November 09, 2015 8:21:01 AM

Item ID: D350-748-143TRN

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N900040100

Setup Start

NS1

Revision ID:

Stop

NS2

Item Name: SS Crosstube Turning Detail

Start Date: 11/9/2015 Start Qty: 1.00

1

Cust Item ID:

Required Date: 11/9/2015 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals:

Process Plan: _____

Date: _____

Tooling: _____

Date: _____

Run Start

NR1

QC: _____

Date: _____

SPC (Y/N): _____

Date: _____

Stop

NR2

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
150		0.00							
150	Large Fab								
Crosstubes	Memo	0.01							
Crosstubes	1-Grind machining marks								
190		0.00							
190	Packaging								
Packaging	Memo	0.00							
Packaging	Identify and stock in kanban rack Location: <u>LG03</u>								
200		0.00							
200	QC21- Final Inspection - Work Order Release								
QC	Memo	0.00							
Quality Control									

JW 15-11-23JW 15-11-03MLJ 15-11-23MLJ 15-11-23

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____		DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐		AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐					
Date :		Step #:		QTY Effective :			MRB (QSI042) Approval		
Description Work Order Deviation				Disposition				Completed By	
								Lead hand / Supervisor Approval Verification	
								QC / QA Coordinator Approval	
Root Cause		FAULT CATEGORY							
Environment ☐	No Re-verification ☐	Pressure/Forced ☐	Temperature/Cure ☐	Power Loss/Surge ☐	Positioned Wrong ☐				
Design ☐	Operator ☐	Bending ☐	Set-up ☐	Folio/Program ☐	Outside Dimensions ☐				
Doc/Data ☐	Offset/Setup ☐	Centre Not Concentric ☐	BOM/Route ☐	Grain ☐	Over/Under tolerance ☐				
Equip/Tooling ☐	Supplier ☐	Cracks ☐	Broken/Damage/Defect ☐	Weld ☐	Part Incorrect ☐				
Handling/Pre ☐	Training ☐	Crimp/Kink/Ripple/Wave ☐	Inspection Incomplete/Unqualified ☐	Wrong Stock Pulled ☐	Part Lost/Missing ☐				
Material ☐	Use for Testing ☐	Cuffs ☐	Contamination ☐	Out of Sequence ☐	Part Moved ☐				
Internal Transport ☐	Poor Information ☐	Crushing ☐	Countersink ☐	Off-set ☐	Drawing ☐				
Tribal Knowledge ☐	Rushing ☐	Heat Treat ☐	Cut Too Short ☐	Mislabeled ☐	Finish ☐				
LOA ☐	Product Improvement ☐	Wave/Twist in Tube ☐	Instructions Incomplete/Unclear ☐	Fit/Function ☐	Misread ☐				
Substation ☐	Process Improvement ☐	Marks/Chatter ☐	Drill Holes ☐	Misaligned/off center ☐	Turning Sequence ☐				
Past Expiry Date ☐	Manufacturing Process ☐	OTHER : _____							
Misidentified ☐	Past Due ☐								

Picklist Print

Monday, November 09, 2015 8:21:05 AM

Page 1

Work Order ID: 138673

138673

Parent Item: D350-748-143TRN

D350-748-143TRN

Parent Item Name: SS Crosstube Turning Detail

Start Date: 11/9/2015

Required Date: 11/9/2015

Start Qty: 1.00

Required Qty: 1.00

Comments: NEW ISSUE - PRELIM - LL 12.05.08

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6021-125		Manufactured	No				Each	87.0000		1			

D6021-125

Crosstube Material - 17-4Ph SS

Location

Loc Qty

Loc Code

HALL

55

127271

35

85076

20

32

32

Handwritten: HALL 127272

Handwritten: L m m L 15/11/11

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____		DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐		AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐					
Date :		Step #:		QTY Effective :			MRB (QSI042) Approval Completed By Lead hand / Supervisor Approval Verification QC / QA Coordinator Approval		
Description Work Order Deviation				Disposition					
Root Cause		FAULT CATEGORY							
Environment ☐	No Re-verification ☐	Pressure/Forced ☐	Temperature/Cure ☐	Power Loss/Surge ☐	Positioned Wrong ☐				
Design ☐	Operator ☐	Bending ☐	Set-up ☐	Folio/Program ☐	Outside Dimensions ☐				
Doc/Data ☐	Offset/Setup ☐	Centre Not Concentric ☐	BOM/Route ☐	Grain ☐	Over/Under tolerance ☐				
Equip/Tooling ☐	Supplier ☐	Cracks ☐	Broken/Damage/Defect ☐	Weld ☐	Part Incorrect ☐				
Handling/Pre ☐	Training ☐	Crimp/Kink/Ripple/Wave ☐	Inspection Incomplete/Unqualified ☐	Wrong Stock Pulled ☐	Part Lost/Missing ☐				
Material ☐	Use for Testing ☐	Cuffs ☐	Contamination ☐	Out of Sequence ☐	Part Moved ☐				
Internal Transport ☐	Poor Information ☐	Crushing ☐	Countersink ☐	Off-set ☐	Drawing ☐				
Tribal Knowledge ☐	Rushing ☐	Heat Treat ☐	Cut Too Short ☐	Mislabeled ☐	Finish ☐				
LOA ☐	Product Improvement ☐	Wave/Twist in Tube ☐	Instructions Incomplete/Unclear ☐	Fit/Function ☐	Misread ☐				
Substation ☐	Process Improvement ☐	Marks/Chatter ☐	Drill Holes ☐	Misaligned/off center ☐	Turning Sequence ☐				
Past Expiry Date ☐	Manufacturing Process ☐	OTHER :							
Misidentified ☐	Past Due ☐								

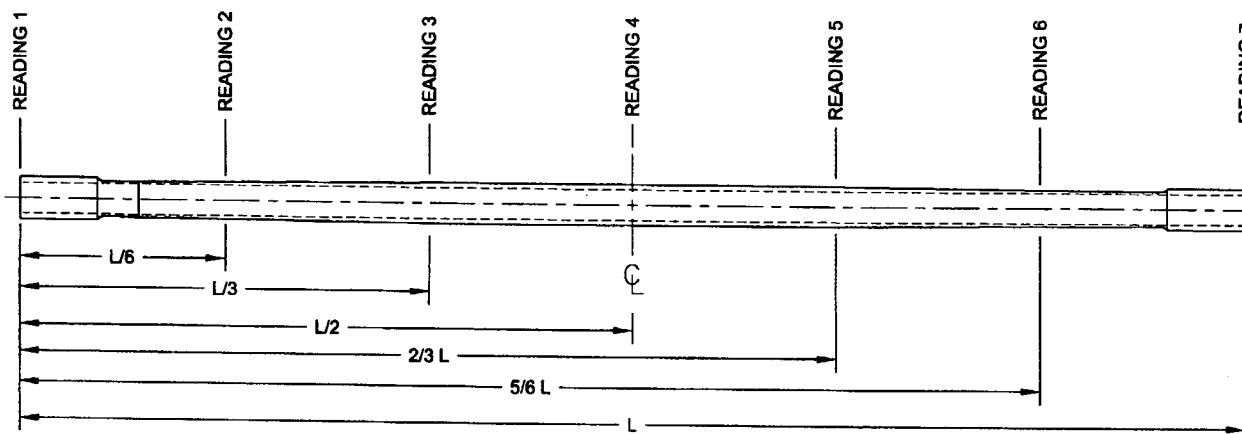
DART AEROSPACE LTD		Work Order:	138673
Description: Crosstube Assembly (AS350/355 High Fwd SS)		Part Number:	D350-748-143
Inspection Dwg: D350-748-143 Rev: A		Page 1 of 2	

FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet	Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+/-0.005	2.243	✓		vern	CNC-08
	2.180	+0.005/-0.000	2.184	✓			
	2.180	+0.005/-0.000	2.183	✓			
	2.237	+0.005/-0.000	2.241	✓			
	2.272	+0.005/-0.000	2.275	✓			
	2.306	+0.005/-0.000	2.310	✓			
	2.339	+0.007/-0.000	2.342	✓			
	2.339	+0.007/-0.000	2.343	✓			
	0.062	+/-0.010	0.062	✓		vern	CNC-08
	5.25	+/-0.060	5.25	✓		"	
	R0.063	+/-0.010	0.062	✓		RG	
	R0.50	+/-0.030	0.500	✓		"	
SIDE B	2.240	+/-0.005	2.245	✓		vern	CNC-08
	2.180	+0.005/-0.000	2.185	✓			
	2.180	+0.005/-0.000	2.184	✓			
	2.237	+0.005/-0.000	2.242	✓			
	2.272	+0.005/-0.000	2.276	✓			
	2.306	+0.005/-0.000	2.310	✓			
	2.339	+0.007/-0.000	2.342	✓			
	2.339	+0.007/-0.000	2.343	✓			
	0.062	+/-0.010	0.062	✓		vern	CNC-08
	5.25	+/-0.060	5.25	✓		"	
	R0.063	+/-0.010	0.063	✓		RG	
	R0.50	+/-0.030	0.500	✓		"	
	112.27	+/-0.060	112.27	✓		type	LG-11

DART AEROSPACE LTD		Work Order: 138673
Description: Crosstube Assembly (AS350/355 High Fwd SS)		Part Number: D350-748-143
Inspection Dwg: D350-748-143 Rev: A		Page 2 of 2

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L= 0"	.123	.122	.127	.124	.005	0.030"
READING 2 L= 19	.128	.127	.130	.131	.004	
READING 3 L= 37	.172	.171	.169	.175	.006	
READING 4 L= 56	.174	.170	.168	.172	.006	
READING 5 L= 75	.176	.170	.170	.173	.006	
READING 6 L= 93	.130	.136	.127	.129	.003	
READING 7 L= 112	.122	.121	.121	.124	.003	

Calibration Result

Actual Block Thickness: .101 - .500

SITESCAN 250 Measured Thickness: .100 - .500

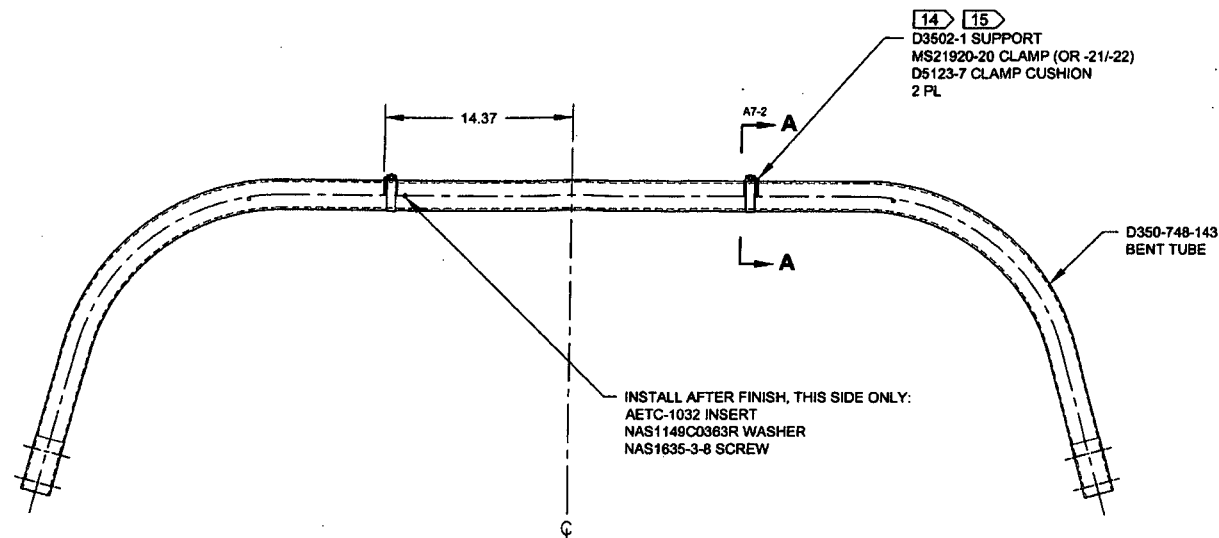
DAS
47

Measured by: <u>mmml</u>
Date: <u>15/11/13</u>

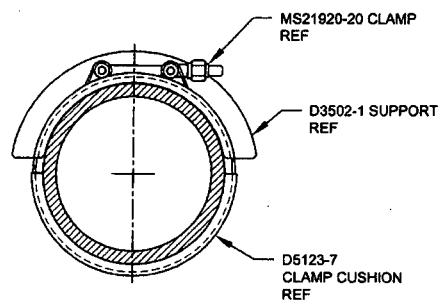
Audited by: <u>9-89</u>
Date: <u>15-11-17</u>

Preliminary Approval:
Date:

Rev	Date	Change	Revised by	Approved
A	15.09.09	New Issue (P/O D350-748-103)	KJ <u>[Signature]</u>	<u>[Signature]</u>



**D350-748-143
ASSEMBLY DETAIL**



SECTION A-A D4-2
SCALE 6X

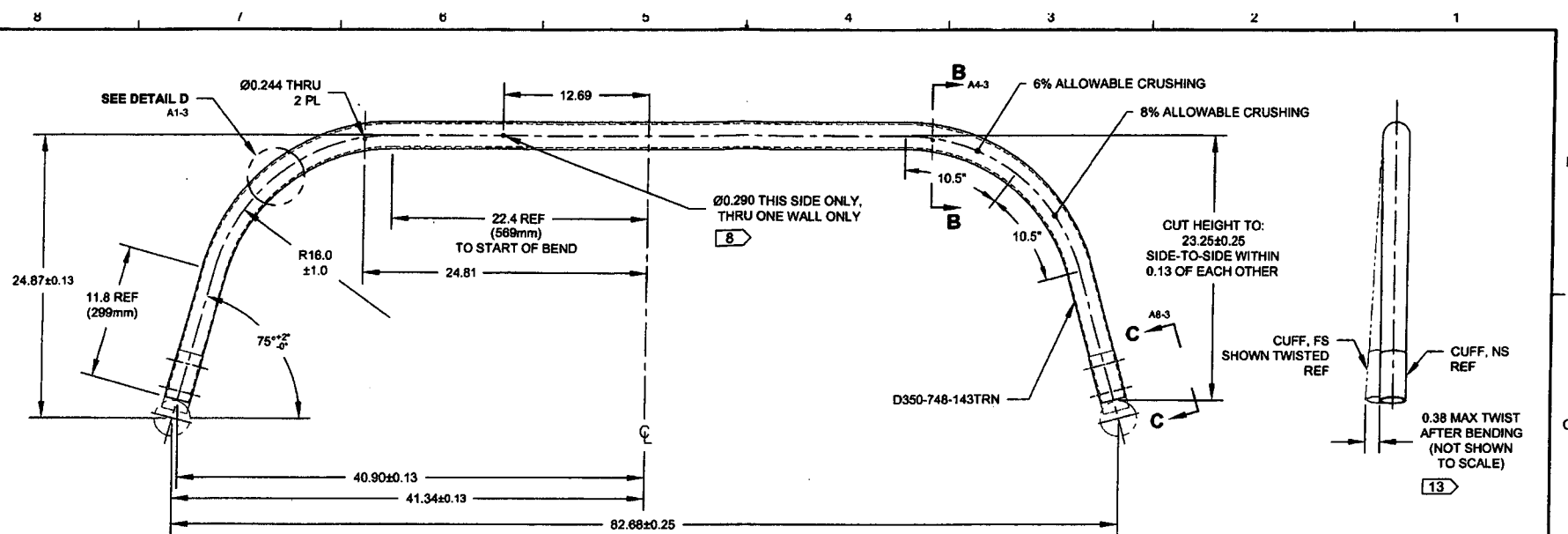
UNDER REVIEW

4/15/4/28

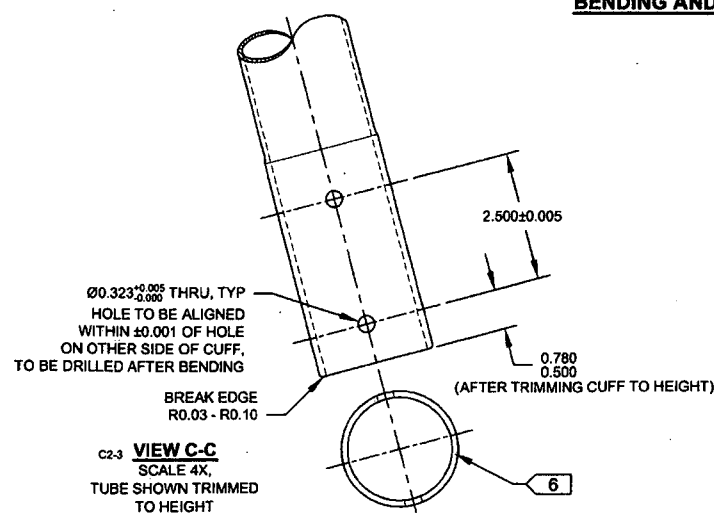
RELEASED

2015 MAR 18
47 ECW-15-547

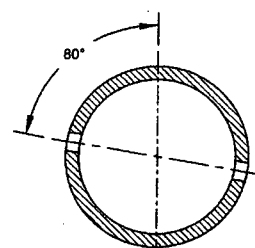
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DRAWN	47	HAWKESBURY, ONTARIO, CANADA	
CHECKED	47	DRAWING NO.	REV. A
MFG. APPR.	47	D350-748-143	SHEET 2 OF 4
APPROVED	47	TITLE	SCALE
DE APPR.	47	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	15.01.21	COPYRIGHT © 2015 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL, AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	



**D350-748-143
BENDING AND DRILLING DETAIL** 11



VIEW C-C
SCALE 4X,
TUBE SHOWN TRIMMED
TO HEIGHT



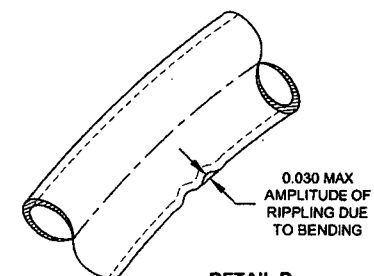
SECTION B-B D3-3
SCALE 6X

RELEASED

2015 MAR 18

UNDER REVIEW

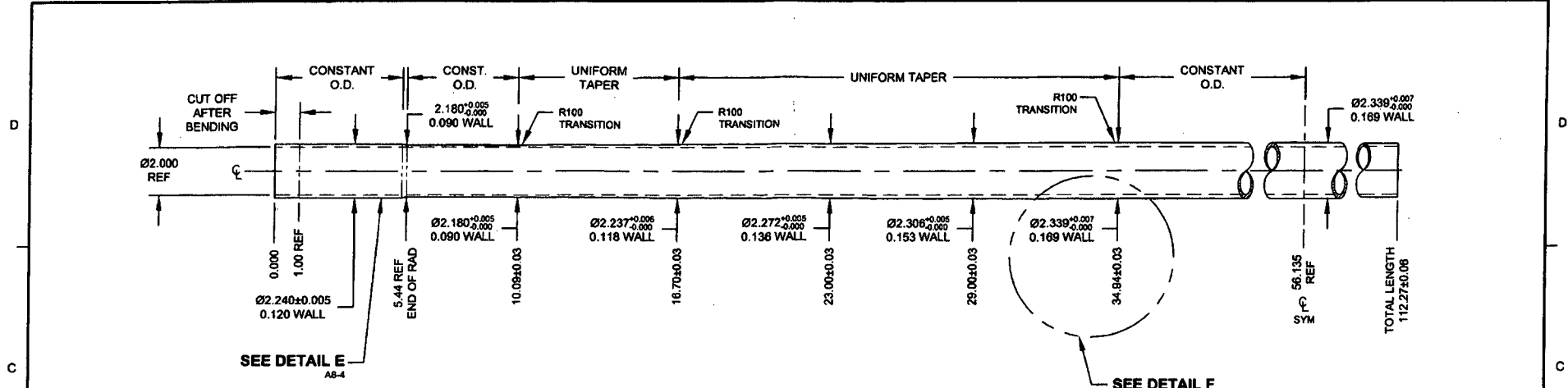
15/4/28



DETAIL D D7-3
SCALE 4X
RIPPING EXAGGERATED

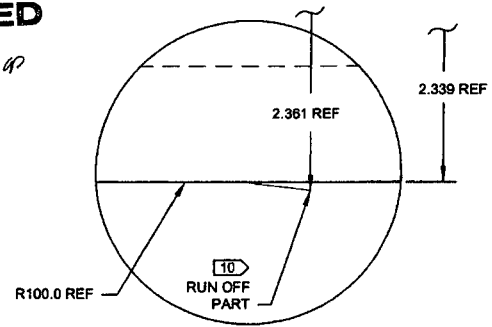
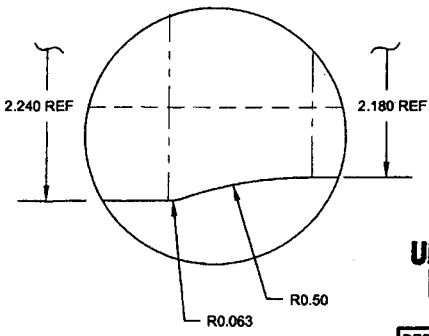
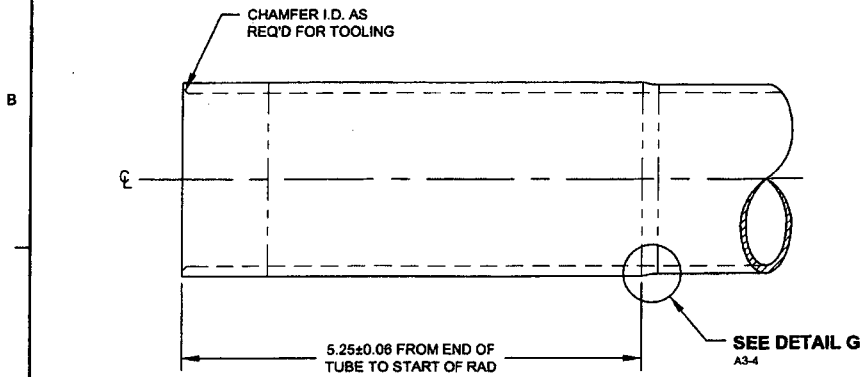
DESIGN	90	DART AEROSPACE LTD	
DRAWN	90	HAWKESBURY, ONTARIO, CANADA	
CHECKED	A.P.	DRAWING NO.	REV.
MFG. APPR.		D350-748-143	SHEET 3 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	15.01.21	COPYRIGHT © 2015 BY DART AEROSPACE LTD	
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8 7 6 5 4 3 2 1



**D350-748-143TRN
TURNING DETAIL**

RELEASED
2015 MAR 18



UNDER REVIEW
15/4/28

DESIGN	AP	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	AP	DRAWING NO.	REV. A
CHECKED	AP	D350-748-143	SHEET 4 OF 4
MFG. APPR.	AP	TITLE	SCALE
APPROVED	AP	CROSSTUBE (AS 350/355 HI FWD)	NTS
DE APPR.	AP	COPYRIGHT © 2015 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	
DATE	15.01.21		

8 7 6 5 4 3 2 1